

Diversity of Living Things

OVERALL EXPECTATIONS

- analyze the effects of various human activities on the diversity of living things
- investigate the principles of scientific classification using appropriate sampling and classification techniques
- demonstrate an understanding of the diversity of living things, in terms of both the principles of taxonomy and phylogeny

BIG IDEAS

- All living things can be classified according to their anatomical and physiological characteristics.
- Human activities affect the diversity of living things in ecosystems.

UNIT TASK PREVIEW

In the Unit Task you will select a group of organisms and then examine the role the group plays in supporting ecosystems. You will investigate specific threats to the group's diversity by examining how human actions influence it in both negative and positive ways.

The Unit Task is described in detail on page 120. As you work through the unit look for Unit Task Bookmarks to see how information in the section relates to the Unit Task.



A FIRST OR LAST CHANCE TO SEE?

The biosphere contains an astounding diversity of living things. Living things inhabit virtually every square metre of Earth's surface, from the deepest ocean trenches to the highest mountain tops. Life comes in a truly astonishing array of shapes and sizes, both familiar and bizarre. You may recognize and admire bald eagles, humpback whales, and polar bears, but know little about—and even fear—vampire bats, tarantulas, and giant squid.

Biologists discover new types of living things daily, but they have catalogued only a fraction of the millions of different kinds of living things thought to inhabit Earth. Biologists also continue to discover important interconnections among organisms. For example, most plants rely on soil fungi to get nutrients from the soil, and most animals depend on microscopic organisms living within their bodies to help them digest food.

You are fortunate because you will have the opportunity in your life to admire, study, and benefit from the millions of kinds of organisms with which you share this planet. If you are lucky, you may see moose while hiking or paddling through Ontario's beautiful old growth forests, or examine the several types of small carnivorous plants that live in Ontario bogs. You may travel to an ocean to go whale watching or scuba over a coral reef, or perhaps visit a tropical rainforest!

Unfortunately, opportunities like this are limited by past human actions and may be limited even more in the future. Climate change, habitat destruction, pollution, and the introduction of invasive organisms are posing a serious threat to the diversity of life on a global scale. For the many living things that are endangered, the situation is grave. The years ahead may be our last chance to see them before they become extinct.

The situation is far from hopeless, however. Actions and decisions we make can help sustain healthy ecosystems and conserve the diversity of life on Earth. In this Unit, and throughout this book, you will learn about the connections between science, technology, society, and the environment (STSE). Making wise choices today while keeping these connections in mind can ensure that future generations have a chance to see, admire, and experience this amazing diversity of life.

Questions

- Some kinds of organisms are far more dramatic than others. People often marvel at their first sight of an elephant or whale, a beautiful flower, or a towering tree.
 - In a small group, brainstorm a list of 10 or more of the most interesting kinds of organisms. Provide reasons for your selections.
 - Which of these organisms have you seen in real life? Which would you like to see?
- Humans are very dependent on other organisms for survival. Other organisms supply us with foods, clothing, medicines, and building materials.
 - Did your list of organisms in question 1 include organisms that benefit you?
 - In your group, make a second list of 10 or more organisms that you think are most important to humans. Explain your reasoning.
- Although people are most familiar with plants and animals, the living world also contains many kinds of fungi, protists, and other microscopic organisms. Do you think these organisms are as important as plants and animals? Why or why not?
- Many scientists are concerned about threats to Earth's biodiversity. Do you share this concern? What responsibility do you think we have to protect biodiversity?

CONCEPTS

- understand scientific terminology related to cells, organisms, and ecosystems
- compare and contrast different kinds of cells
- recognize the postulates of the cell theory
- understand that all living things are interdependent
- recognize that human actions influence other species and the sustainability of ecosystems

SKILLS

- make biological drawings
- properly use and care for a microscope
- prepare dry and wet mount slides
- make and record careful observations
- communicate ideas, plans, procedures, results, and conclusions using appropriate scientific terminology and formats
- analyze and interpret qualitative and quantitative data

Concepts Review

- The following key terms are associated with the ways in which scientists gather information and conduct investigations. Explain the meaning of each term: **K/U T/I**
 - hypothesis
 - independent variable
 - dependent variable
 - controlled experiment
- Decide if each statement is true or false. If it is true, copy it directly into your notebook. If it is false, rewrite it to make it true. **K/U**
 - All living things are made up of many cells.
 - Living things grow, reproduce, and repair themselves.
 - Most living things require energy to function.
 - Animals respond to changes in their environment, but plants do not.
 - All organisms perform photosynthesis, but only plants perform cellular respiration.
- Match each term with correct definition. **K/U**

(a) mutualism	(i) a situation in which two organisms live in close contact and at least one benefits
(b) symbiosis	(ii) a situation in which one organism lives in or on another organism and feeds on that organism
(c) parasitism	(iii) a situation in which two organisms live in close contact and both benefit
(d) commensalism	(iv) a situation in which two organisms live in close contact; one benefits and the other is not affected
- Describe the relationships among an embryo, tissues, and the process of cell differentiation. **K/U**

- Many biology news stories refer to advances in genetics. How are the terms “genetic” and “genetic information” related to chromosomes, DNA, and inherited information? **K/U T/I**
- State the function of each of the following: **K/U**

(a) chromosomes	(e) DNA
(b) mitochondria	(f) ribosomes
(c) chloroplasts	(g) nuclei
(d) flagella	
- Compare and contrast the following terms: **K/U**
 - cell wall and cell membrane
 - unicellular and multicellular
 - mitosis and the cell cycle
- State the function of each of the following: **K/U**
 - muscle tissue
 - nervous tissue
 - vascular tissue
 - epithelium
- Biologists classify organisms into large groups called “Kingdoms.” Copy the table and place each of the following organisms under the proper kingdom heading. Note that only the five most well known kingdoms are included. **K/U**

tuna	mushroom	fern	amoeba
salmonella	ant	bread mould	yeast
slug	<i>E. coli</i>	moss	

Bacteria	Protists	Fungi	Plants	Animals
- We are most familiar with plants and animals, but they are just two groups of organisms on Earth. List two or three characteristic features of the following groups of living things: **K/U**
 - protists
 - fungi
 - bacteria

11. (a) What does the term “micro-organism” mean?
 (b) Give one or two examples of micro-organisms.
 (c) What invention was necessary for the discovery of these organisms?
 (d) How did this invention alter our understanding of all organisms? K/U
12. Brainstorm a list of different kinds of organisms that might live in a particular habitat, such as a forest, field, or pond. Then draw a hypothetical food web that shows how they are interconnected. T/I C
13. How does a food web illustrate the interdependence of one kind of organism with another? Use an example from your food web in question 12 to explain what would happen to the ecosystem if one kind of living thing were removed. T/I A
14. Give one or two examples of ways in which living things influence and are dependent upon
 - (a) the carbon cycle
 - (b) the water cycle
 - (c) the nitrogen cycle K/U A
15. Humans interact with other kinds of living things in many ways. Some of these interactions are harmful to ecosystems. Match the term on the left with the description of the interaction on the right. K/U A

<ol style="list-style-type: none"> (a) invasive species (b) monoculture (c) climate change (d) extirpation 	<ol style="list-style-type: none"> (i) Humans are producing large quantities of greenhouse gases that trap thermal energy. (ii) Habitat loss and pollution can lead to the loss of a species from a particular region. (iii) Humans often introduce organisms into new environments with unforeseen consequences. (iv) Humans often grow crops in large fields containing a single kind of plant.
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16. Humans can also act to ensure that ecosystems remain sustainable. K/U T/I A
 - (a) What does “sustainable” mean?
 - (b) Give an example of an action you could take to improve the sustainability of ecosystems.
 - (c) How is the sustainability of an ecosystem influenced by the diversity of living things in the ecosystem?
17. You, like all humans, depend on other organisms for food. But food is only one of the many benefits to humans of other organisms. Brainstorm and list the many ways that you benefit from other organisms in your daily life. T/I C A

Skills Review

18. Examine the cells in **Figure 1**. K/U T/I A
 - (a) Identify each cell as a plant, animal, bacteria, or protist. Give reasons for your choices.
 - (b) What evidence suggests that some of these organisms have the ability to move?
 - (c) What evidence suggests that one of these organisms has the ability to produce its own food?

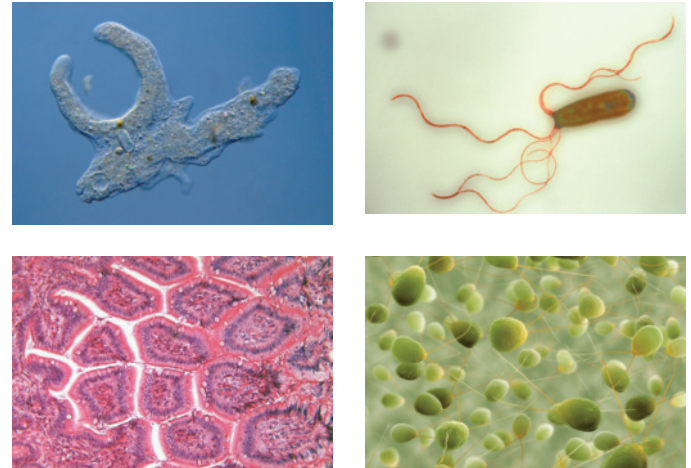


Figure 1

19. List the characteristics of a good biological drawing. K/U
20. Make a biological drawing of one of the cells in Figure 1. K/U C
21. Describe how you would make a wet mount of a sample of banana cells. C
22. Describe the step-by-step procedure you would use to observe cells under high power. T/I C
23. Suggest several safety precautions that you think should be taken when studying live organisms. A
24. When you use the Internet for research, you often find countless different sources of information.
 - (a) What criteria do you use to determine if the information is accurate and reliable?
 - (b) What steps do you take that allow you to use and present this information effectively without plagiarizing? T/I C



CAREER PATHWAYS PREVIEW

Throughout this unit you will see Career Links in the margins. These links mention careers that are relevant to the diversity of living things. On the Chapter Summary page at the end of each chapter you will find a Career Pathways feature that shows you the educational requirements of the careers. There are also some career-related questions for you to research.